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**ORIGINAL ARTICLE**

# Surgical Management and Treatment Approaches of Bilateral Lung Cyst Hydatid Disease: A Single Center Retrospective Study

# Bilateral Akciğer Kisti Hidatik Hastalığının Cerrahi Yönetimi ve Tedavi Yaklaşımları: Tek Merkezli Retrospektif Bir Çalışma

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**ABSTRACT**

**Aim:** This study aimed to review the management and treatment approaches for patients who underwent surgery for bilateral pulmonary hydatid cysts in our clinic.
**Methods:** A total of 175 patients who underwent surgery for pulmonary hydatid cysts between January 2008 and February 2023 were retrospectively analyzed. Bilateral pulmonary hydatid cysts were detected in 16 patients (9.14%), and 12 patients who underwent bilateral surgical treatment were included in the study.
The average age of the patients was 36.7 ± 18.0 years (ranging from 15 to 65 years), with an equal number of males and females. One patient underwent simultaneous bilateral thoracotomy, while the others received sequential thoracotomy for surgical treatment. A total of 36 pulmonary hydatid cysts were removed across 23 surgical sessions involving 12 patients. The cysts had an average diameter of 4.7±1.42 cm and were predominantly located in the lower lobes (56%). The contralateral side was operated on an average of 3.81 months after the intervention on one hemithorax. After the second operation, albendazole treatment at a dosage of 10 mg/kg/day was initiated. No operative mortality was recorded, and the average follow-up duration was 26.6 months.
**Conclusion:** This study emphasizes the importance of reviewing the necessary criteria for successful surgical planning in cases of hydatid cysts in bilateral lungs. According to the data obtained, prioritizing numerous, larger, and intact cysts can help minimize the risk of potential operative complications.
**Keywords:** Hydatid cyst, outcomes, pulmonary surgical treatment

**ÖZ**

**Amaç:** Bu çalışmanın amacı, kliniğimizde bilateral akciğer kist hidatiğinde cerrahi müdahale geçiren hastaların yönetimini ve tedavi yaklaşımlarını incelemektir.
**Gereç ve Yöntemler:** Ocak 2008 ile Şubat 2023 arasında pulmoner hidatid kistleri için cerrahi müdahale geçiren toplam 175 hasta retrospektif olarak analiz edildi. 16 hastada (%9.14) bilateral pulmoner hidatid kistleri tespit edildi ve bilateral cerrahi tedavi uygulanan 12 hasta çalışmaya dahil edildi.
**Bulgular:** Hastaların ortalama yaşı 36.7 ± 18.0 yıl (aralık 15-65) olup, cinsiyet dağılımı eşit idi. Bir hasta aynı anda bilateral torakotomi uygulandı, diğerleri için ardışık torakotomi uygulandı. 12 hasta üzerinden toplam 36 pulmoner hidatid kisti çıkarıldı ve 23 cerrahi seans gerçekleştirildi. Kistlerin ortalama çapı 4.7±1.42 cm olup, çoğunlukla alt lobda (% 56) yer aldı. Kontralateral cerrahi ortalama 3.81 ay sonra uygulandı. İkinci operasyondan sonra, günde 10 mg/kg dozunda albendazol tedavisine başlandı. Cerrahi mortalite kaydedilmedi. Ortalama takip süresi 26.6 aydır.
**Sonuç:** Bu çalışma, bilateral akciğer kist hidatiğinde cerrahi planlama için gerekli kriterlerin gözden geçirilmesini vurgulamaktadır. Elde edilen verilere göre, sayıca çok, boyut olarak büyük ve patlamamış kistlerin olduğu taraftan cerrahi tedaviye başlamak, potansiyel cerrahi komplikasyon riskini en aza indirmeye yardımcı olabilir.

**Anahtar kelimeler:** Kist hidatik, pulmoner cerrahi tedavi, sonuçlar

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## INTRODUCTION

Hydatid cyst disease is a parasitic condition frequently occurring in regions where agriculture and livestock farming are prevalent, with humans serving as intermediate hosts (1,2). It is an endemic parasitosis commonly found in developing countries (3-4). The incidence ranges from one to 150 cases per 100,000, with the rate of patients undergoing surgery in our country varying annually between 0.87 and 6.6 per 100,000 (4). After the liver, the lungs are the second most commonly affected organs, accounting for 10-40% of cases. However, the incidence of bilateral pulmonary hydatid cysts varies between 4% and 26% across different studies (5).

In our center, located in the west of Turkiye, we are seeing fewer and fewer hydatid cyst patients. This can be attributed to the decreasing number of migrations from the East, the inclusion of stray animals in an effective vaccination program, and the public's education about food hygiene. This study aims to assess the planning of surgical treatment for bilateral pulmonary hydatid cysts and to evaluate the early and long-term surgical outcomes of the cases that underwent surgery.

## MATERIALS and METHODS

Patients were evaluated after approval was obtained from the local ethics committee (Decision No: 2021-57/2022-67). The study was conducted under the principles of the Declaration of Helsinki. Between January 2008 and February 2023, 175 patients underwent surgery for pulmonary hydatid cysts in our clinic. Of the patients analyzed retrospectively, 16 (9.14%) were diagnosed with bilateral hydatid cysts, and 12 patients who underwent bilateral surgical treatment were included in the study. The remaining patients with bilateral disease were excluded from the study due to various reasons: one patient refused surgery, two were considered high risk for contralateral thoracotomy, and another patient was monitored because their cyst was smaller than 2 cm.

Before surgery, the diagnosis was established for all patients through medical history, physical examination, hematological and biochemical tests, chest X-rays, and computed tomography scans.

All of our patients were found to have positive Indirect Hemagglutination Assay (IHA) test. Considering the anamnesis, symptoms, radiological findings, and IHA results, our preliminary diagnosis while planning surgery was a hydatid cyst. Table 1 presents the demographic information of the patients. The Charlson comorbidity index (CCI) was utilized to assess the patient's comorbidities. Abdominal organs were examined for hydatid cysts via ultrasound, and only one patient underwent transdiaphragmatic frenotomy for extrapulmonary hydatid cyst intervention.

Contralateral thoracotomy was performed on average 3.81 months (ranging from 1 to 14 months) later. The patient's clinical status and radiological findings were guiding factors in determining the time interval between the operations. Radiological imaging findings of the patients were instrumental in identifying which side would be prioritized for surgical intervention. Radiological signs of perforated cysts served as clues for other intact cysts (Figure 1). Among the three patients with bilateral intact cysts, the larger size was prioritized

**Table 1.** The demographic characteristics of the patients

| Number | Age (yrs) | Sex | Complaints | Cysts | Largest Cyst Diamete (cm) | Extra Thoracic Cyst Hydatic | RUL | RML | RLL | LUL | LLL | Elapsed Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 38 | M | Back Pain | Intacted | 3 | Liver | 0 | 0 | 2 | 0 | 1 | Simultaneous |
| 2 | 26 | F | Fever | Intacted | 6 | Liver | 1 | 0 | 1 | 3 | 0 | 3 month |
| 3 | 16 | M | Salty taste in the mouth | Perforated | 5 | None | 0 | 2 | 0 | 1 | 0 | 1 month |
| 4 | 23 | F | Cough | Perforated | 6 | None | 0 | 0 | 1 | 0 | 3 | 2 month |
| 5 | 47 | M | Cough | Perforated | 4 | Liver | 0 | 0 | 1 | 1 | 1 | 2 month |
| 6 | 65 | F | Shortness of Breath | Perforated | 4 | None | 1 | 0 | 0 | 1 | 0 | 10 month |
| 7 | 29 | M | Cough | Perforated | 8 | Liver | 0 | 0 | 1 | 0 | 1 | 2 month |
| 8 | 57 | F | Hemoptysis | Perforated | 4 | Liver | 0 | 0 | 1 | 0 | 1 | 14 month |
| 9 | 36 | F | Salty taste in the mouth | Perforated | 3 | None | 1 | 0 | 0 | 1 | 1 | 2 month |
| 10 | 65 | M | Shortness of Breath | Perforated | 5 | Liver | 0 | 0 | 2 | 0 | 1 | 1 month |
| 11 | 23 | F | Salty taste in the mouth | Perforated | 5 | Liver Spleen | 1 | 0 | 0 | 2 | 1 | 2 month |
| 12 | 15 | M | No active Complaints | Intacted | 4 | Liver | 0 | 0 | 1 | 1 | 0 | 3 month |

F:Female, M: Male, RUL: Right upper lobe, RML: Right middle lobe, RLL: Right lower lobe, LUL: Left upper lobe, LLL: Left lower lobe

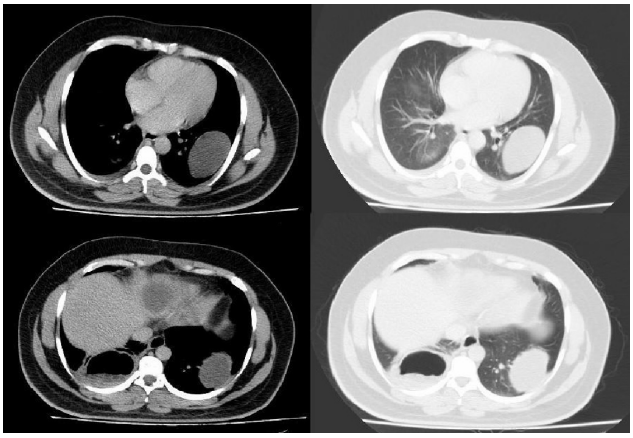

**Figure 1:** Appearance of a perforated hydatid cyst in the liver and a perforated cyst in the right hemithorax, with an intact cyst on the left hemithorax, as seen on computed tomography.

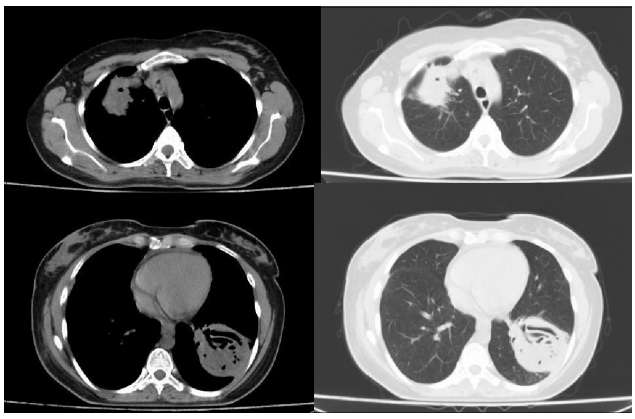

**Figure 2:** Computed tomography image showing bilateral perforated hydatid cysts.

in two, while the side with more cysts was prioritized in the other two.

### *Surgical Procedure*

Patients were intubated with a double-lumen endotracheal tube before surgery. A posterolateral thoracotomy was performed while preserving a single muscle to carry out cystotomy and capitonnage. If the cyst was deep within the parenchyma, cyst fluid was removed via needle aspiration. After excising the germinative membrane, the thoracic cavity was irrigated with either 0.04% chlorhexidine gluconate or hypertonic solutions. Segmental bronchial leaks were closed using 3-0 polypropylene (Prolene) sutures. Obliteration of the cyst cavity was performed with 3-0 polyglactin (Vicryl) sutures. Anatomical resections were not performed on any patient. A 32F chest drain

was placed in each patient before closure.

### *Postoperative Follow-Up*

After extubation, patients were monitored in the surgical intensive care unit until their general condition stabilized. Chest tubes were removed when the daily drainage volume was less than 100 mL. Complications such as bleeding, prolonged air leak, wound infection, and empyema were monitored during the first 30 postoperative days.

Patients were evaluated based on demographic data, length of hospital stay, morbidity, mortality, and recurrence. Follow-up information was obtained through office visits or telephone interviews conducted with the patient, a relative, or a primary care physician. Routine oral albendazole treatment at a dosage of 10 mg/kg/day was initiated approximately two weeks after the second operation.

### *Statistical Analysis*

The data were presented using measures of central tendency and dispersion, percentages, and frequencies for demographic data and surgical outcomes. Statistical analyses were conducted using the Statistical Package for Social Sciences, version 22.0 software (SPSS, Inc., Chicago, IL, USA).

## RESULTS

The most frequently observed symptoms in patients were cough and salty taste in the mouth, reported at a rate of 23.1%. Alongside clinical signs, radiological imaging, and intraoperative findings, nine cysts were assessed as perforated. The average age of the patients was 36.7 ± 18.0 years (ranging from 15 to 65 years). The study included six male (50%) and six female (50%) patients. Among the patients, eight had a CCI of "0" (61.5%), two had a CCI of "1" (15.4%), one had a CCI of "2" (7.7%), and one had a CCI of "3" (7.7%). The demographic characteristics of the patients are provided in Table 1.

The largest cysts' average size was 4.7±1.42 cm. A total of 36 cystotomies were performed on 12 patients. The most common location of cysts was the lower lobe, accounting for 8 cases (66.7%). In 4 patients with one side intact and the other side perforated, treatment was initiated from the side with the intact cyst. A bilateral thoracotomy was performed in one patient with bilateral perforated cysts during the same session. Among the patients, 7 (58.3%) had bilateral pulmonary hydatid cysts accompanied by extrathoracic hepatic hydatid cysts, while one patient (8.3%) had hydatid cysts in both the liver and spleen. Surgical intervention for splenic hydatid cysts was performed through frenotomy from a thoracotomy incision in only one of the eight patients with extrathoracic hydatidosis. Also, 66% of these patients with bilateral hydatid cysts had extrapulmonary involvement (Table 1).

No complications requiring additional postoperative surgical intervention were observed. The average length of hospital stay was 10.5±2.15 days (ranging from seven to 14 days). The patient with bilateral cysts measuring approximately 10 cm had the longest postoperative stay of eight days and required bronchoscopy due to secretion retention after the first operation on the intact side. An average of 3.81 months (ranging from one to 14 months) elapsed before intervention on the contralateral cyst was performed. In two of our patients, we performed contralateral surgery later than planned (10 and 14 months later). The pulmonary

rehabilitation process took time for the patient, on whom we performed surgery 10 months later due to shortness of breath that was present before the first operation. The reason for the delay in surgery in our patient, who underwent surgery 14 months later, was due to personal problems. During this period, our patient was admitted to our hospital due to a recurrence of hemoptysis. No operative mortality was observed. No recurrences, morbidity, or mortality were noted throughout the follow-up duration, which varied from one to 62 months (averaging 26.6 months).

## DISCUSSION

The main goal of surgical treatment for pulmonary hydatidosis is to completely remove the parasite, prevent any dissemination during surgery due to potential cyst rupture, and eliminate the remaining cavity based on surgical principles that maximize the preservation of lung tissue (6, 7). Given the variability in the location and extent of cysts among patients, it is essential to tailor treatment plans to each case. Medical treatment not combined with surgery is generally not recommended due to high recurrence and complication rates (8, 9). However, it is still used for patients who refuse surgery or are considered inoperable. In our study, we planned surgical treatments for patients based on these principles. Additionally, oral albendazole was administered at a dosage of 10 mg/kg/day approximately two weeks after the second surgical procedure.

The management of surgical treatment for bilateral lung cysts remains a topic of debate. Many researchers have advocated various surgical strategies for single-stage operations, including median sternotomy, single-stage bilateral thoracotomy, transsternal submammary thoracotomy (clamshell incision), and video-assisted thoracoscopic mini-thoracotomy. Despite these suggestions, the prevailing practice leans towards performing two-stage resections. In our series, only one patient with suspected perforated hydatid cysts in both hemithoraces underwent simultaneous bilateral thoracotomy.

Determining which side to prioritize in two-stage procedures is also an important issue. In the case of uncomplicated cystic formations, the lung with the larger cyst or a greater number of cysts is generally addressed first (10). In patients with cysts larger than 4 or 5 cm on one lung and a perforated cyst on the other, priority is given to removing the intact cyst to reduce the risk of rupture. In our study, in the cases where one side was perforated and the other side was intact, surgical treatment was commenced on the intact side based on this reason. Although there were no major complications after surgery, some patients did experience secretion retention that required bronchoscopy.

When evaluating the radiological investigations of the patients, the perforation and infection status of the cystic structures should be carefully assessed alongside clinical findings. While there is no clear consensus on the period between the two operations, the patient's clinical status and preferences often guide this decision. A waiting period of at least 2 to 4 weeks after the first surgery is generally recommended before addressing lesions on the contralateral side (6-9). In our patients, intervention on the contralateral cyst was performed after an average of 3.81

months (ranging from one to 14 months). In making this decision, the potential problems that may arise from leaving the remaining cyst postoperatively were considered.

Aydın et al. (11) reported that hydatid cysts of the liver coexist in 20-40% of cases of pulmonary hydatid cysts. Additionally, publications indicate that extrapulmonary hydatid cysts can affect the pleural space, mediastinum, and chest wall. In a study by Aydin et al. (9) in 2024, which included 107 patients with bilateral cysts, 58.9% of the patients were found to have extrapulmonary involvement. Among those with extrapulmonary involvement, 92.1% had liver involvement, and it was noted that 76.2% of these cases exhibited only lung and liver involvement. In our study, the rate of isolated bilateral pulmonary hydatid cysts was determined to be 33.3%. And 66% of these patients with bilateral hydatid cysts had extrapulmonary involvement.

Based on the literature, the mortality rates associated with surgical interventions for pulmonary hydatid cysts are reported to range from 1% to 2% (12). The postoperative recurrence rates are similarly reported to be between 1% and 3% (10, 11). In our series, no postoperative mortality or recurrences were observed.

Surgical planning should depend on whether the cysts are intact or complicated, their diameters, and the risk of dissemination in the presence of bilateral cysts. Onal et al. (1) recommend a two-stage surgical approach for bilateral cases. Bilateral pulmonary hydatid disease is typically managed with a two-stage posterolateral thoracotomy. The interval between the two thoracotomies should be long enough to adequately assess postoperative complications; however, it should also be relatively short to prevent potential complications on the other lung and avoid complications arising from hydatid cysts. The literature suggests a waiting period of between 3 weeks and 3 months between bilateral staged thoracotomies (1, 10, 13).

In our study, all patients were diagnosed through a combination of clinical evaluation, imaging methods, and serological testing. Specifically, all patients tested positive for the Indirect Hemagglutination Assay (IHA), which supported the diagnosis of pulmonary hydatid cysts alongside radiological findings. Although imaging remains the primary modality for diagnosis, especially in pulmonary involvement, serological tests such as IHA and ELISA are reported to provide additional diagnostic value, particularly in atypical presentations or in cases with extrapulmonary involvement (12, 14). Morar and Feldman (14) emphasized that while serological tests may have lower sensitivity in isolated pulmonary echinococcosis, they are more diagnostically valuable in widespread disease involving organs such as the liver. IHA is commonly used in many centers due to its practicality and accessibility, contributing meaningfully to the diagnostic process (14). In our center, routine use of IHA testing provided a reliable basis for surgical planning.

The main downside of this approach is that it may delay wound healing, prolonging the wait time between surgeries. However, if a patient is in good condition and needs multiple thoracotomies, the second procedure can be done on the opposite side during the same anesthesia session once the first thoracotomy is completed. Young patients can tolerate this procedure with low surgical risk. In addition to its

psychological and economic benefits, a shorter hospital stay is another advantage (6, 13). Our perspective is that waiting for an average of 3 to 4 weeks between the two operations would be more appropriate.

Surgical management of pulmonary hydatid cysts remains controversial regarding the choice between minimally invasive and open approaches. Balta et al. (15) conducted a comparative study between video thoracoscopy and thoracotomy, concluding that in cases of large or complex cysts, thoracotomy provided a lower complication rate and a safer surgical approach compared to the video-assisted thoracic surgery (VATS). Also, Onal et al. (1) have reported that in cases of pulmonary hydatid cysts—particularly those that are bilateral, large, or at risk of rupture—muscle-sparing thoracotomy is a safe and effective approach. Their findings support the preference for open surgical techniques over VATS in complex or extensive cystic disease cases. In our clinic, VATS is generally not preferred for patients with hydatid cysts larger than 6 cm and multiple or complicated cystic formations. As mentioned in the study, open surgical approaches such as thoracotomy are prioritized in cases involving large, complex cysts due to the increased risk of intraoperative complications and the limited feasibility of minimally invasive techniques. Additionally, for cases of bilateral pulmonary hydatid cysts, the surgical plan is determined based on the patient's general condition and the radiological characteristics of the cysts. To minimize the risk of complications, priority is given to the surgical removal of the larger and intact cysts first. Therefore, traditional open surgery techniques are favored over VATS in our treatment approach.

The primary limitations of this study are as follows: its retrospective design and the inclusion of only 12 patients significantly limit the statistical power and generalizability of the findings. Furthermore, the inability to assess early and long-term postoperative pain outcomes, coupled with the absence of a comparative analysis between different surgical techniques, hampers a clear evaluation of the relative safety and efficacy of these approaches. Additionally, since only operable patients were enrolled and long-term follow-up was limited for some individuals, fully assessing recurrence rates and late complications remains challenging.

## CONCLUSION

In conclusion, with hydatid cysts in both lungs, this study re-examines the necessary criteria for successful surgical planning. Based on the data obtained, the aim can be to minimize the risk of potential operative complications by prioritizing larger, intact cysts. When bilateral surgical interventions are planned based on radiological data and the patient's general condition, they can be performed with low morbidity and without mortality.

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